SHARP
Compact Color Image Sensor Camera
IV-C35M

New product news

Improve your productivity and quality using color image processing.

The IV-C35M compact color image sensor camera has an integrated color image processing function, for making inspections or measurements that are not possible using a monochrome camera, and it includes an improved measurement program.

The operating environment has also been improved with features like an as easy-to-read display and simplified operation.

Remote keypad
(IV-S30RK1)

LCD monitor
(IV-10MTK)

Controller
(IV-C35M)

Color camera
(IV-C30C5)

COMPACT COLOR IMAGE SENSOR CAMERA
IV-C35M

The IV-C35M assists you with improved inspection and measurement precision, as well as offering better productivity and quality control.

COMPACT COLOR IMAGE SENSOR CAMERA
IV-C35M

A variety of color filters and a color extraction function clearly distinguish subtle differences in tone and density.

Conventional monochrome cameras cannot distinguish subtle differences in hue and contrast, even if they are equipped with custom filters. In addition to filtering the three primary colors (red, green, and blue), the IV-C35M can make accurate images of objects using brightness and other optional filters, in order to inspect and measure their qualities. It also has a color extraction function.

Improvements in productivity and quality are critical issues in production. Of course, these issues are equally important to inspection and measurement processes. Sharp has contributed new solutions for inspection and measurement processes by developing low-priced, high-performance image sensor cameras that leave the others behind. Now, aiming for even greater improvements in productivity, we have developed the IV-C35M compact color image sensor camera. It can inspect and measure workpieces with minute differences in hue and contrast that would have been impossible to evaluate using conventional monochrome cameras. While keeping the highly sophisticated specifications of earlier models, such as a unique partial image capture function, this camera is equipped with a variety of color filters and advanced measurement programs. Operability has been greatly improved with features such as interactive, description-based parameter settings that can be used by anyone, and an easy to read color screen. We would like you to consider our IV-C35M compact color image sensor camera if you want to make greater improvements in productivity and quality control. It can be used for inspections and measurements in many ways.
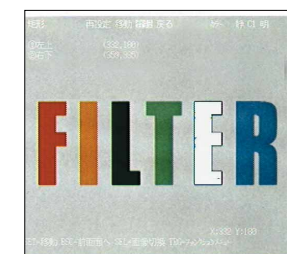
IV-C35M controller

Color filter functions for the three primary colors (RGB) and brightness and 5 optional filters allow easy evaluation.

Select the color components and brightness of an area you want to evaluate, and display just the specified component. Then convert it to a 256 gray scale or binary image.

NOTE The color filter can be set to display the specified color brightly after gray scale image processing. This is effective in evaluating subtle differences in color, or for finding flaws or dirt that have similar colors or tones.

Original color image

Conventional mono-chrome processing
If the hue or color saturation is very similar between adjacent areas, the images cannot be evaluated.

Conventional gray image processing
The density of this image can be measured. However, the hue and color saturation cannot be evaluated.

R (red) filter
Displays red areas more brightly.
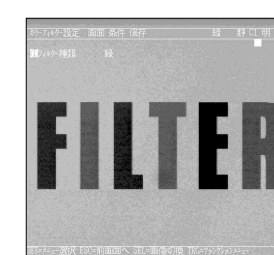
G (green) filter
Displays green areas more brightly.

B (blue) filter
Displays blue areas more brightly.
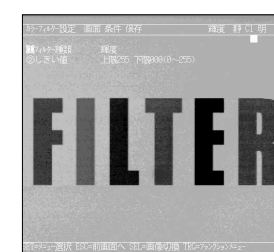
Brightness filter
Displays areas that are within the specified brightness range (within the specified upper and lower limits) more brightly.

Optional filter
Specify the optimum color filter parameters to use, based on the original image conditions.

NOTE The optional filter is effective if the RGB filters are not used to show areas as brighter.

Color extraction function that can evaluate a variety of colors.

Specify a color to extract from the original image. The controller eliminates all areas of the image except those that have the specified color. Then, it converts what is left into a binary image.
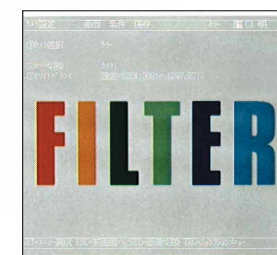
Color extraction
For example, you can extract just the blue area of the letter "E" in the image on left.

NOTE This color extraction function not only works with hue and saturation, but also with brightness. Therefore, achromatic objects that cannot be processed using a color filter can still be extracted.

* The controller can extract up to 8 colors in one object type. By specifying multiple object types, it can be used to evaluate even more colors.

Other applications
- Inspect letters with different colors or background colors.
- Distinguish filled and empty containers when both the material and the container have similar colors.
- Detect missing pills in a card of pills.
- Check for the presence of an adhesive agent when there is only a small difference between the color density of the base material and the agent.

●Can be used to make the following inspections and measurements (using the color extraction function)

**Check for lit LEDs in mobile phones**
Check whether or not the LEDs in a mobile phone are lit properly. (Also effective in inspecting the color indicators on an LCD display.)

Provide good or NG judgments and detect incorrect positions of objects using area measurement and object counting by binary conversion.

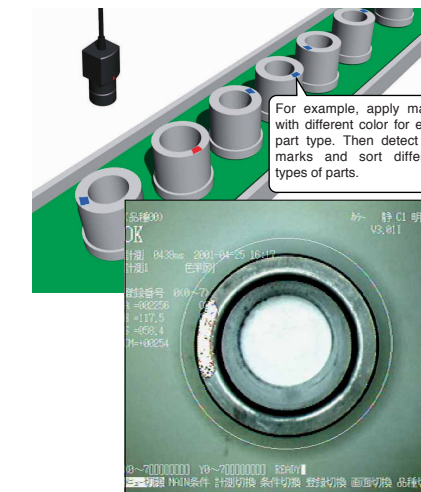**Check for incorrect wire harness arrangement**
Detect whether a wire harness is wired as called for in the specifications.
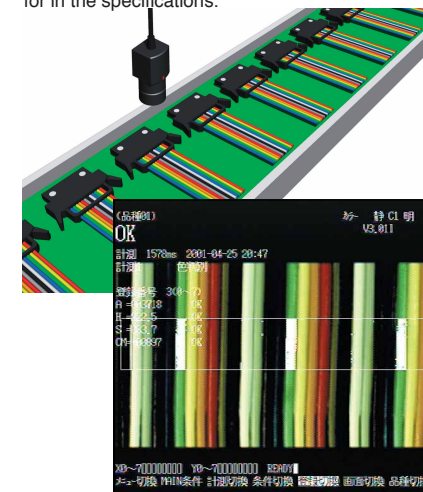
A wire harness inspection looks at the arrangement of the wires by checking for the specified wire colors using color evaluation and color position measurement.
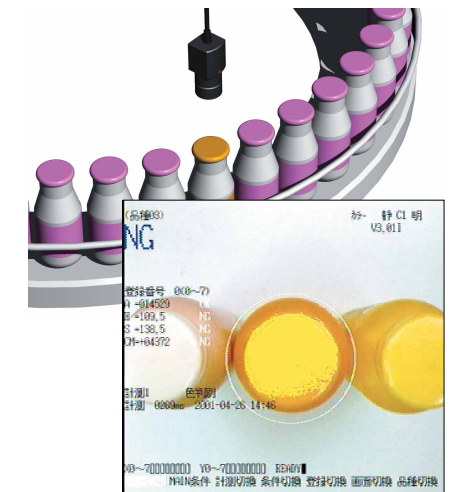
Sorting inspection of parts
Sort parts with almost no difference and which therefore cannot be identified by their shape.

For example, apply marks with different color for each part type. Then detect the marks and sort different types of parts.
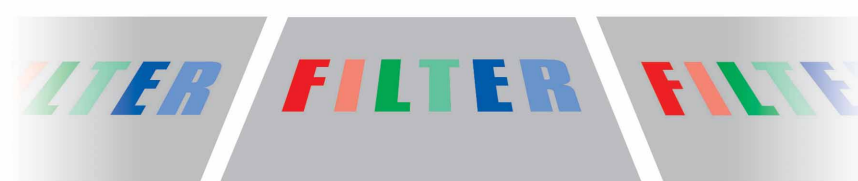
Determine whether a color mark matches the reference color using color evaluation and area measurement by binary conversion.

Inspect by evaluating the color of caps
Sort caps and prevent contamination of different types of material by checking the color of each cap.

Evaluate whether the cap color matches the reference color.

Thanks to the variety of measurement menu items and the simplified operation, it can be operated by inexperienced people.
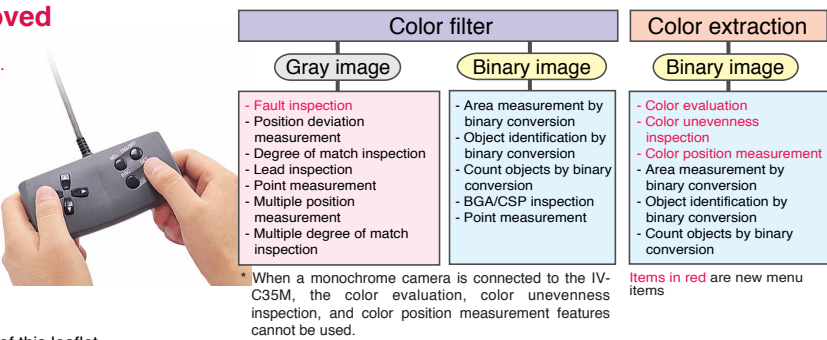# Reducing the cycle operation time contributes to improved productivity.

COMPACT COLOR IMAGE SENSOR CAMERA
IV-C35M

When you want to use the machine to make inspections and measurements with high precision

The measurement menu has been improved urther by adding new menu items.

The IV-C35M can be used to make a variety of measurements and inspections such as looking for uneven color or evaluating the color of objects.

In addition to conventional measurement menu items, new items have been added for color related functions. Just select the menu program items that match your application. 18 measurement menu items are available. Use a remote keypad to select items from the menu. You don't need to spend the time or pay the price of creating sophisticated programs for precise measurements. You can start using the IV-C35M in your operation the same day you receive it.

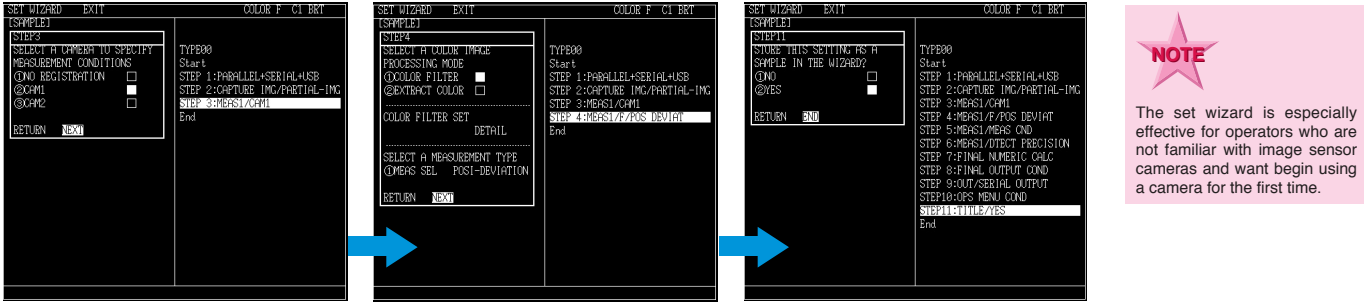- For details about each measurement program, see the back cover of this leaflet.

Color filter		Color extraction
Gray image	Binary image	Binary image
- Fault inspection - Position deviation measurement - Degree of match inspection - Lead inspection - Point measurement - Multiple position measurement - Multiple degree of match inspection	- Area measurement by binary conversion - Object identification by binary conversion - Count objects by binary conversion - BGA/CSP inspection - Point measurement	- Color evaluation - Color unevenness inspection - Color position measurement - Area measurement by binary conversion - Object identification by binary conversion - Count objects by binary conversion

* When a monochrome camera is connected to the IV-C35M, the color evaluation, color unevenness inspection, and color position measurement features cannot be used.

Items in red are new menu items

Want to decrease the time spent setting up a process? Want to use a simple operation to make settings quickly?

The menu tree and set wizard functions guide you through the operation procedures.
Even a beginner can set up the camera easily, without any difficulty.
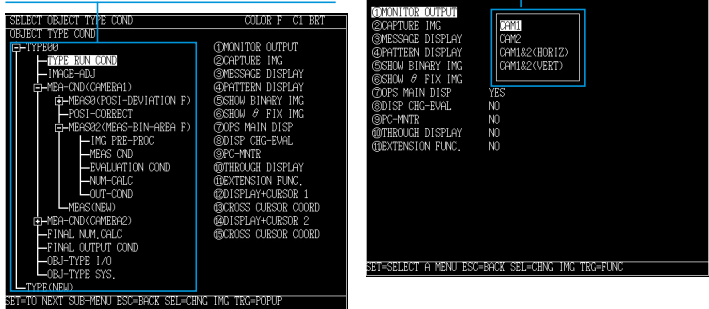
●Make settings using the set wizard.

Select the set wizard from the main screen, and then just select the appropriate items on each screen. Since you can advance quickly while confirming the settings you are making, you can eliminate mistaken settings and be ready to start operations within a short time.

NOTE
The set wizard is especially effective for operators who are not familiar with image sensor cameras and want begin using a camera for the first time.

●Setting up measurement programs using the menu tree

The menu tree (which shows the layered organization of the screens at a glance) allows you to advance through each layer and the necessary menu items quickly, with confidence. If you want to see a screen to confirm your settings, you can go directly to the specific screen from the menu tree.

Layered organization of display screens in the menu tree.

●Screens can also be edited as you wish

You can edit the operation screen by moving, enlarging or reducing and displaying or hiding information on the operation menu.
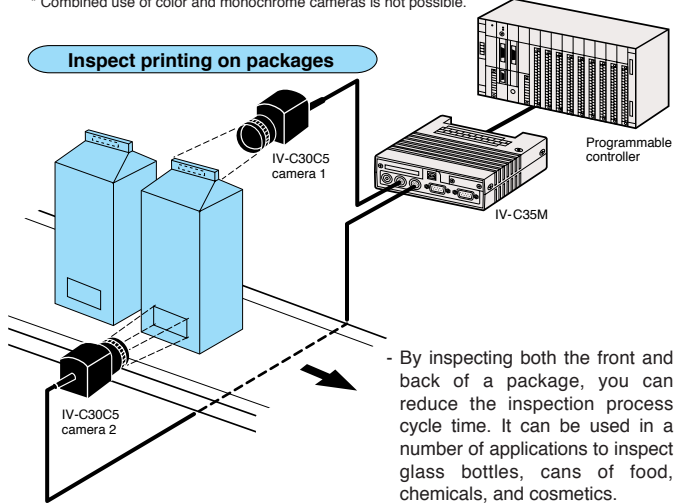
Selected from a popup menu.

◀ Standard operation screen

▼ Operation screen after being edited

NOTE
Even operators with experience in setting up image sensor cameras will find that the unique menu tree is effective.
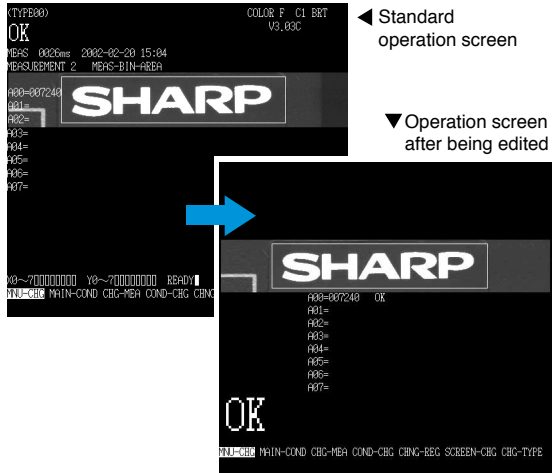
Do you want to shorten your cycle times?

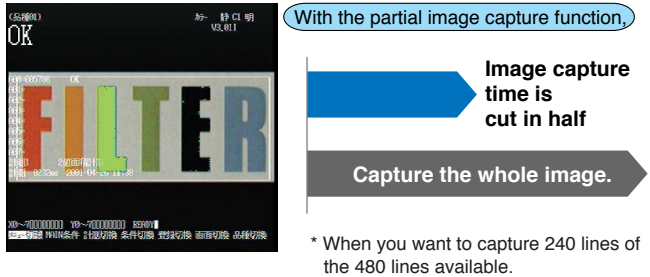### Shorten the total processing cycle time using two cameras.

Two color cameras (IV-C30C5) or two high-speed monochrome cameras (IV-S30C3/C4) can be connected to one IV-C35M controller. This feature can reduce the cycle time even more by creating a system designed for things like simultaneous positioning of two points, simultaneous inspection of two positions on a workpiece, and capturing two images with a simultaneous shutter, which can be shown on a split display screen.

* Combined use of color and monochrome cameras is not possible.

Inspect printing on packages

IV-C30C5 camera 1

IV-C30C5 camera 2

IV-C35M

Programmable controller

- By inspecting both the front and back of a package, you can reduce the inspection process cycle time. It can be used in a number of applications to inspect glass bottles, cans of food, chemicals, and cosmetics.

A partial image capture function, a special feature from Sharp, reduces the image-capture time even more.

If you want to reduce your inspection and measurement times, you can use our unique partial image capture function. The partial image capture function limits the area an image is taken from, reducing the capture time by 1/2.

With the partial image capture function,

Image capture time is cut in half

Capture the whole image.

* When you want to capture 240 lines of the 480 lines available.

Five CCD trigger functions are included in the controller and there is no need for an external sensor.

Five CCD trigger functions are included: color, binary conversion, average density, gray search, and edge detection. Since the controller can trigger measurement when a specified color is detected, there is no need for an external sensor. You can cut your initial costs and you don't need to position or adjust an external sensor for each object type.

← Scanning direction

CCD trigger
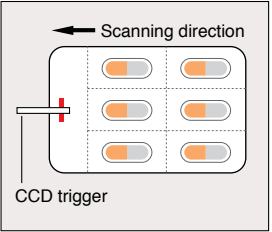
A maximum of 32 object types can be registered, to deal with lots of different object types and small lot production.

To make inspections and measurements of multiple object types and small lots, each object type can have different object shapes and colors, so the number of items you can register is actually larger. The IV-C35M can register up to 32 object types, the largest number in the field, and it allows you to make a quick change of the object being processed. By using a memory card (192 Mbytes), you can actually save the settings for up to 1200 object types.

No need for a tilting angle correction jig, since the IV-C35M has a 360°-rotation correction function.

Since the controller can correct the rotation of an image through a full 360°, it can evaluate large angular deviations in printing on packages, and it can be used as a robotic eye for a chucking machine.

Electronic shutter function can be set as high as 1/10000sec

The shutter speed can be set between 1/30 and1/10000 sec for each object type, and you can obtain stable, clear images, even when the objects are being fed at high speed.
This unit can adjust the light level without changing the lighting when the object type is changed.

Do you want to export your product?

The IV-C35M has applied for CE marking and it can be installed in machines intended to be sold overseas.

It can be installed on products that will be shipped abroad. It will provide productivity improvements in overseas production bases, the same as when used in domestic factories.
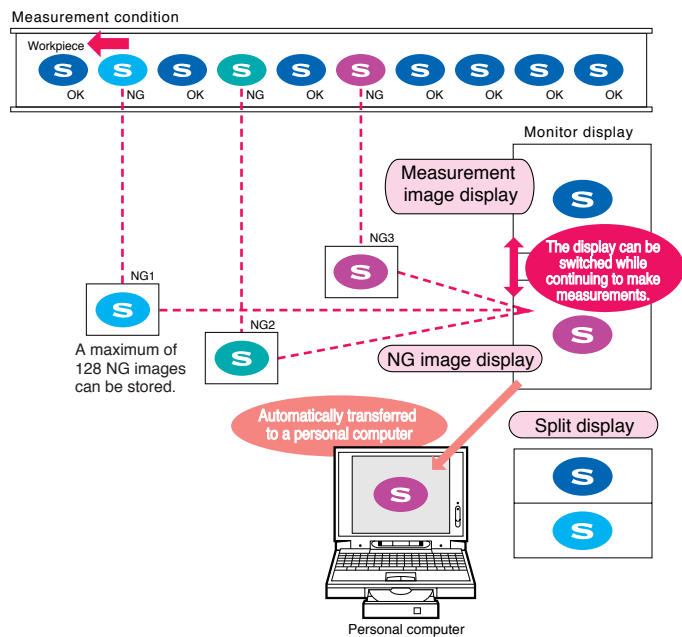
3

4

SHARP's unique function and support software contribute to improved quality.

Do you want to eliminate problems?

Displays previous NG images and the current image at the same time. Automatically transfer NG images to a personal computer through the USB port, while continuing to measure.

This function is used to decrease production problems and improve productivity and quality. While making measurements you can check the NG image history (maximum of 128 images) and display both the current image and other NG images on a monitor. Using a USB port, it can automatically transfer NG images to a personal computer. You can immediately analyze faults and can take effective countermeasures to improve productivity and quality.

Measurement condition

Workpiece

S S S S S S S S S S S
OK NG OK NG OK NG OK OK OK OK OK

Monitor display

Measurement image display

The display can be switched while continuing to make measurements.

NG3

NG1

A maximum of 128 NG images can be stored.

NG2

NG image display

Automatically transferred to a personal computer

Split display

Personal computer

Store 264 NG images* on a flash memory card.

When a compact flash memory card is installed in the controller housing, NG images can be stored on the card.

* 512x480 pixels 192MB. When a flash memory card is used.

Read the OK/NG results easily by looking at a colored display of the measurement area and evaluation result information.

Since the IV-C35M can display the measurement area in any color and the results of the evaluation can be display in any specified color, you can easily see for yourself if the result is OK or NG.
(This function is available even when a monochrome camera is connected.)

Do you want to improve development and design productivity?

Customize your image-processing equipment, simply and quickly by using our image-processing library.

Image processing library for the IV-S30 series
IV-S30LB1 For Windows 95/98/Me/NT4.0/2000

Although the color image sensor camera IV-C35M has a variety of inspection and measurement functions, the IV-S30LB1 image processing software library can meet your needs simply and quickly if you want to add functions for special inspection and measurement purposes, change the display, or just need a certain function. If you can write programs in the C language, you can create your own original image sensor systems using this standard library software, a C compiler, and a debugger.

■Product configuration of the IV-S30LB1

CD-ROM	Image processing library (approx. 300 types), OS (a part of μITRON), program transfer software
Development instruction manual	Development methods, memory areas, I/O map, and sample programs.
Library instruction manual	Description of functions, with sample problems
Cable	USB cable, RS232C cable (between a personal computer and the IV-C35M main housing, for transferring programs)

* **The USB port can only be used with Windows98.**

■Development environment

IV-C35M/S30 series	IV-C35M, IV-S32MX/33MX, IV-S30RK1, IV-C30C5, IV-S30C1/C3, IV-S30KC3, IV-S20L16, monitor
Personal computer	Running Windows 95/98/ME/NT4.0/2000.
C compiler	HITACHI SH-4 C compiler V5.0.
Recommended debugger	COMPUTEC JTG debugger, HITACHI PC card emulator E10A (A PC card slot is required in your personal computer)

You can set and store various data and evaluate samples over the Internet simply, securely, and quickly in the familiar Windows environment.

Parameter setting support software for the IV series
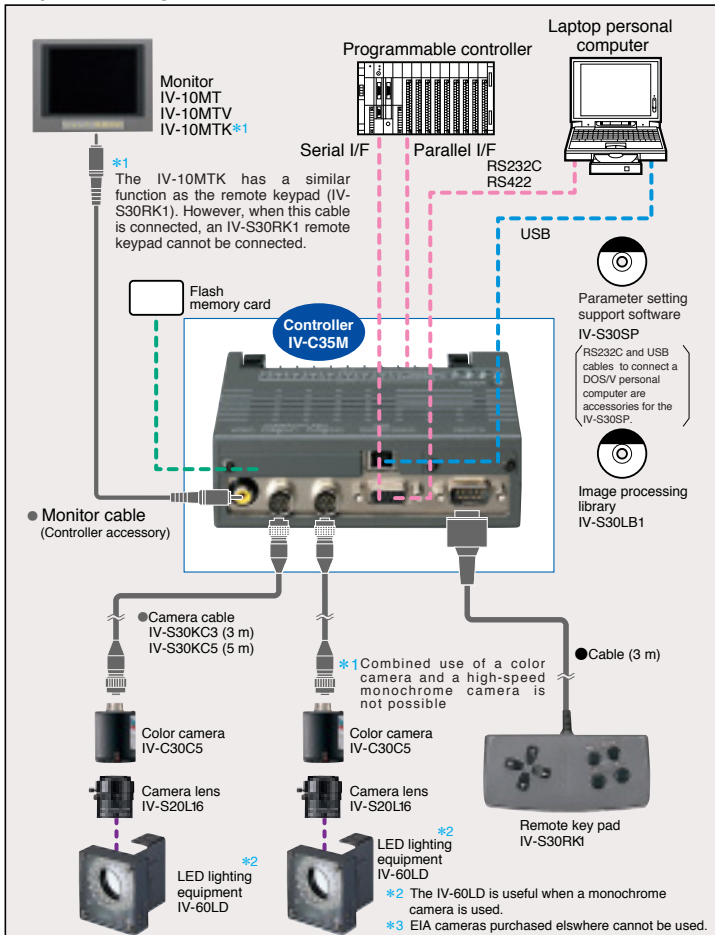### IV-S30SP For Windows 95/98/Me/NT4.0/2000

It runs on Windows95/98/Me/NT4.0/2000 platforms, and allows users to specify data, and to manage and analyze inspection results using a personal computer.
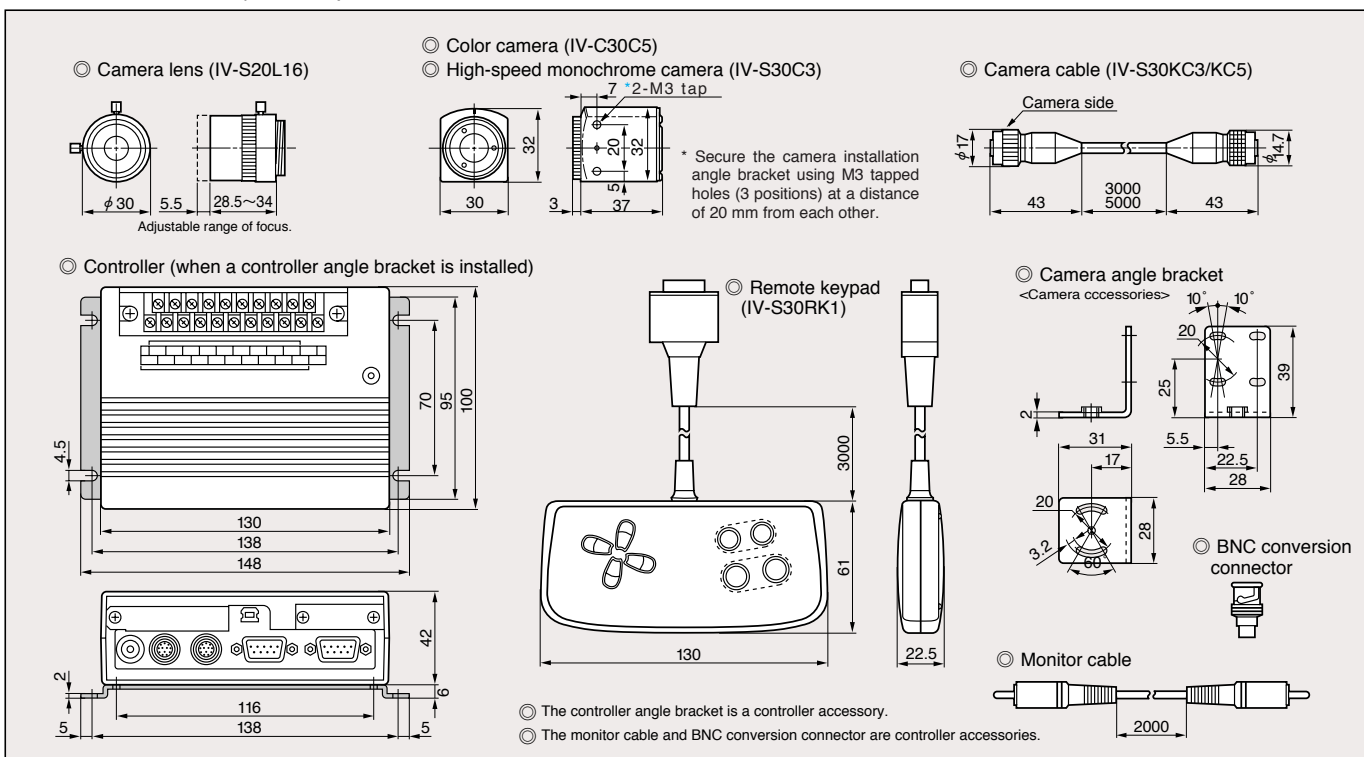
■IV-S30SP operating environment

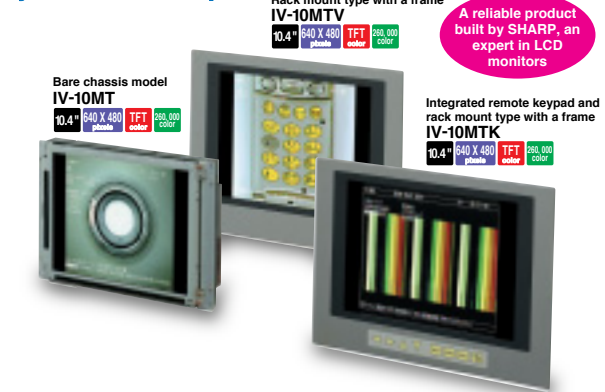|	
Operating environment	Windows95/98/Me/NT4.0/2000
Personal computer	IBM PC/AT or compatible machine
CPU	Pentium 90 MHz minimum (recommend Pentium 133 MHz or better)
Memory	32 M-bytes minimum (recommend 48 M-bytes or more)
Hard disk	30 M-bytes or more free space
Mouse	A mouse or pointing device compatible with Windows95/98/Me/NT4.0/2000
Display	800 x 600 pixel resolution (1024 x 768 recommended) 256 colors or more
Printer	A printer compatible with Windows95/98/Me/NT4.0/2000
CD-ROM drive	One drive
RS-232C port	One port or more
USB port	One port recommended

* **The USB port can only be used with Windows98.**

■System configuration

Monitor
IV-10MT
IV-10MTV
IV-10MTK *1

Programmable controller

Laptop personal computer

Serial I/F   Parallel I/F

RS232C
RS422

*1 The IV-10MTK has a similar function as the remote keypad (IV-S30RK1). However, when this cable is connected, an IV-S30RK1 remote keypad cannot be connected.

USB

Flash memory card

Controller IV-C35M

Parameter setting support software IV-S30SP
RS232C and USB cables to connect a DOS/V personal computer are accessories for the IV-S30SP

Image processing library IV-S30LB1

● Monitor cable (Controller accessory)

●Camera cable
IV-S30KC3 (3 m)
IV-S30KC5 (5 m)

*1 Combined use of a color camera and a high-speed monochrome camera is not possible

●Cable (3 m)

Color camera IV-C30C5

Color camera IV-C30C5

Camera lens IV-S20L16

Camera lens IV-S20L16

Remote key pad IV-S30RK1

*2

LED lighting equipment IV-60LD

LED lighting equipment IV-60LD

*2 The IV-60LD is useful when a monochrome camera is used.
*3 EIA cameras purchased elsewhere cannot be used.

Color LCD monitor that makes the image processing system more compact

Rack mount type with a frame
IV-10MTV

A reliable product built by SHARP, an expert in LCD monitors

Bare chassis model
IV-10MT

Integrated remote keypad and rack mount type with a frame
IV-10MTK

■IV-C35M product line

Item name		Model name	Specification or details
Controller		IV-C35M	Color filter and color extraction functions. Register 32 object types.
Camera	Color	IV-C30C5	C mount
	High-speed monochrome	IV-S30C3	C mount, 2x, 4x
	Micro, high speed	IV-S30C4	17 mm dia. mount, 2x, 4x
Camera cable		IV-S30KC3	Cable for IV-C30C5/S30C3/C4 camera, 3 m
		IV-S30KC5	Cable for IV-C30C5/S30C3/C4 camera, 5 m
Camera lens		IV-S20L16	C mount lens with a 16 mm focal length
Remote keypad		IV-S30RK1	Keys for remote entry
Memory card		---	Compact Flash ™
Parameter setting support software		IV-S30SP	Runs on Windows95/98/NT4.0/2000
Image processing library		IV-S30LB1	Runs on Windows95/98/NT4.0/2000
LCD monitors		IV-10MT	Bare chassis type 10.4" TFT color LCD
		IV-10MTV	10.4" TFT color LCD with a mounting frame
		IV-10MTK	10.4" TFT color LCD with a built-in remote keypad and a mounting frame
LED lighting equipment		IV-60LD	Integrated light source and controller in one housing

■External dimensions (unit: mm)

◎ Camera lens (IV-S20L16)

Ø 30   5.5   28.5~34
Adjustable range of focus.

◎ Color camera (IV-C30C5)

◎ High-speed monochrome camera (IV-S30C3)

7 *2-M3 tap

* Secure the camera installation angle bracket using M3 tapped holes (3 positions) at a distance of 20 mm from each other.

◎ Camera cable (IV-S30KC3/KC5)

Camera side

3000
5000

43   43

◎ Controller (when a controller angle bracket is installed)

130
138
148

116
138

◎ Remote keypad (IV-S30RK1)

3000

130   22.5

◎ Camera angle bracket
<Camera accessories>

◎ BNC conversion connector

◎ Monitor cable

2000

◎ The controller angle bracket is a controller accessory.
◎ The monitor cable and BNC conversion connector are controller accessories.

■ Specifications of IV-C35M controller

Image sampling system		16,770,000 colors, 256 level gray scale, binary conversion, edge detection
Number of pixels		512 (horizontal) x 480 (vertical), approx. 240, 000 pixels
Image memory		One screen for displaying captured images. One color screen for displaying camera information and messages
No.of assignable object type		32
Maximum number of reference images stored / number of whole screens stored		600 / 8 screens
Gray search time		9ms *1
Gray search, edge detection precision		Pixel, sub-pixel
Image processing		Color filter (R, G, B, and optional)
		Color extraction (hue, saturation, and brightness)
		Gray search
Color image pre-processing	Saturation correction	Adjust saturation level
	Brightness correction	Adjust brightness level
Gray image pre-processing	Shading correction	Dividing, subtracting, and filtering
	Comparative calculation between images	Subtracting, absolute value of difference (between camera 1 and reference image, between camera 2 and reference image, between camera 1 and camera 2)
	Gray level changes	Magnification by "n" processing g(+/-) correction, histogram expansion, mid-range emphasis
	Space filter	Smoothing (center/average), edge emphasis, edge extraction, horizontal edge, vertical edge
Binary threshold value		Fixed and threshold value corrections (variation difference/variation rate)
Binary noise elimination		Expansion to contraction, contraction to expansion, area filter
Binary image mask		Specified window (rectangle, circle, oval), any binary image mask
Positional correction method		X/Y correction, rotation correction
Number of measurement programs		Maximum 6 per object type (measurement 0 - camera 1, measurement 0 - camera 2, measurements 1 to 4) *2
Window shape		Rectangle, circle, oval (when using area measurement by binary conversion, object counting by binary conversion, object identification by binary conversion)
Distance and angle measurement		Measure distance (between two points, X coordinate, Y coordinate), measure angle (3 points, 2 points against horizontal line, 2 points against vertical line), auxiliary point (center, circle center, gravity center, line over 2 points, crossing point of two straight lines)
Arithmetic operation		Four basic operations (+, -, X, /), root, absolute value, TAN, ATAN, maximum, minimum, average , total.
NG image memory function		Maximum 128 images (8 whole screens)
Memory card slot		One (compatible with a 192 Mbyte capacity card)
Calendar/timer		Year, month, day, hour, minute
Other functions		Display measuring time, light level monitor function, crosshair cursor display, change display language between Japanese and English, Run screen lock function, display setting menu "yes/no", change image display (through/freeze), change image brightness (bright/dark)
Micro PLC section	Input relays	Parallel input: 8 points
	Output relays	Parallel output: 8 points, general-purpose serial interface Computer link: 16 points
	Auxiliary relays	128 points, special area 18 points
	Timers	8 points, timer setting range: 0.01 to 9.99 seconds (countdown timer)
	Counter	8 points, counter setting range: 000 to 999 (counts down)
External interface	Parallel interface	Input: 8 points, Output: 9 points
	General-purpose serial interface	RS232C/RS422 (2.4 to 115.2 kbps)
	Computer link	Built-in compatibility with certain SHARP, OMRON, Mitsubishi, and Yokogawa models
	USB	USB device node, 12 Mbps
Image output		1 channel, EIA 525 lines, 2:1 interlaced
Number of cameras		Maximum of 2
Compatible cameras		Color: IV-C30C5, High-speed monochrome: IV-S30C3/IV-S30C4
Make settings		Using the IV-S30RK1 remote keypad for IV series and the IV-S30SP parameter setting support software for IV series
Measurement start input	Internal trigger	Color CCD trigger, CCD trigger (gray search)
	External trigger	Trigger input (parallel I/F), general-purpose serial I/F, keypad trigger (for manual measuring)

*1 This is true when the search area is 256 x 256 pixels, the model is 64 x 64 pixels, and the compression is set to 3.
*2 Measurement 0 is only used for positional deviation measurements.

Terminal block	Input	Number of points	8 points: One external trigger, 5 object type change, 2 external input
		Common for input	1 point: + or - common
		Rated input voltage	12/24 VDC
		Input voltage range	10.8 to 26.4 VDC
	output	Number of points	9 points: One READY, 8 user spacific logical output (Y0 to Y7)
		Common for output	1 point: + or - common
		Rated output voltage	12/24 VDC
		Load voltage range	10.8 to 26.4 VDC
		Rated max. output current	100 mA DC
		Output system	MOS FET open drain system
	Power	Power terminals	2 points: 24 VDC and 0 V
Power supply voltage / power consumption			24 VDC (±10%), 12W
Operating ambient temperature/humidity			Approx. 600 g
External dimentions			130 (W) X100 (D) X 42 (H) mm (excluding protruding portions)
Weight			Approx. 600 g

■ Specifications of the color camera IV-C30C5

Optical system	Lens mount method	C mount
Picture taking element	Method	Interline transmission method, 1 CCD color
	Reading system	Full pixel type, partial image scanning is available
	Reading	33.3 ms [full mode]
	Size	1/3 inch
	No. of effective pixels	512 (horizontal) × 480 (vertical)
	Pixel shape	Square
Shutter	Shutter speed (s)	Settable between for each object type, between 1/30 and 1/10,000 sec.
	Method	Random shutter
Connector		Round, 12-pin male connector
Connection to controller		Using custom camera cables (IV-S30KC3: 3 m, IV-S30KC5: 5 m)
Operation ambient temperature/ Operation ambient humidity		0 to 45°C/35 to 85% RH (non-condensing)
Operation atmosphere		No corrosive gases or dust
Outside dimensions (mm)		30 (W) × 32 (H) × 40 (D)
Weight		50 g (not including the lens)

■ Measurement menus that can be used for various inspections

Color extraction mode	Color evaluation	Evaluate whether the extracted color matches the reference color
	Color unevenness inspection	Evaluate color unevenness based on the size of certain extracted areas of color that are outside the reference color range.
	Color position measurement	Measure the position coordinates of a workpiece with the same extracted color as the reference color.
	Area measurement by binary conversion	Measure the extracted color area on a workpiece.
	Object identification by binary conversion	Check for the existence and measure the size of the extracted color areas on multiple workpieces.
	Count measurement by binary conversion	Count the number of separate areas on a workpiece with extracted color.
Color filter mode	Fault inspection	Detect flaws or dirt on a workpiece that are the same color as was emphasized using a color filter function.
	Position deviation measurement	Measure positional deviation between an area on a workpiece whose color was emphasized (using the color filter function) and a reference position.
	Degree of match inspection	Evaluate whether a workpiece is good or not good by the degree of match with a reference image.
	Area measurement by binary conversion	Measure the area of the color on a workpiece that was emphasized using a color filter.
	Count objects by binary conversion	Count the number of separate colored areas on a workpiece that were emphasized by using a color filter.
	Object identification by binary conversion	Check for the existence and measure the size of the areas of emphasized color on multiple workpieces.
	Point measurement	Evaluate whether workpieces are present or not at multiple specified points.
	Lead inspection	Measure the lead width and length, and the distance between the leads in an emphasized image.
	BGA/CSP inspection	Measure the number of objects, area, filet diameter and distance between centers of gravity on BGA/CSP chips whose color has been emphasized.
	Multiple position measurement	Measure the position and number of workpieces with a degree of match to the reference image that is larger than a specified level.
	Multiple degree of match inspection	Measure the degree of match of each workpiece by comparison with a reference image. Count the ones with a degree of match larger than the specified level.

⚠ **To use this device effectively and safely!**
- Make sure to read the instruction manual before use. Make sure to supply the specified power and voltage.